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File Test Section Inf Bd.
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REPORT

58? RP

of

The Infantry Board

No. 1802

BBP (BLASTLESS BAZOOKA POWDER) FOR 2.36" ROCKETS

FORT BENNING, GEORGIA

14 Jan 1945

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GNKIS (D) 471.94 (14 Jun 45) 1st Ind. TVM/el
BBP (Blastless Bazooka Powder) for 2.36" Rockets
HEADQUARTERS THE INFANTRY SCHOOL, Fort Benning, Georgia, 18 June 1945

TO: Commanding General, Army Ground Forces, Army War College, Washington 25, D.C.

The Commandant concurs in the conclusions and recommendations of Infantry Board Report No. 1802.

For the Commandant:

TROY V. MOORE
Captain, A.G.D.
Asst. Adj. Gen.

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IB-471.94

Office of
THE INFANTRY BOARD

Fort Benning, Georgia
12 JUN 1945

SUBJECT: BBP (Blastless Bazooka Powder) for 2.36" Rockets.

THROUGH: The Commandant, The Infantry School.

TO: The Commanding General, Army Ground Forces,
Army War College, Washington 25, D. C.

1. References.

The following report confirms TIB TWX dated 17 Mar 45, subject:

"CG, AGF, AWC, Wash. D.C. -- Attn Gcmdr Sec Fd Ref BBP and plastic nozzle closure for 2.36" rocket: Tests to date indicate that subject rockets give: little or no muzzle blast and particle blast at temperatures of plus one hundred twenty down to minus thirty degrees, less muzzle flash, generally better accuracy, especially when cold, less difference in range and dispersion when fired at different temperatures, better stability in flight and slightly increased range, less recoil. Plastic nozzle closure appears desirable on either standard or BBP rounds. It gives slightly better ignition, better stability and accuracy, less particle blast with either BBP or standard powders at low temperatures. Four per cent misfire obtained with plastic closure due to nozzle edge scraping insulation from wires as closure was inserted. This should be corrected. Main disadvantage of BBP powder is increased smoke. This may be objectionable under some conditions but of little importance under others. Face mask appears unnecessary with BBP powder and plastic closure down to minus twenty degrees. Order of desirability of combinations appear to be: first, BBP with plastic closure, second: BBP with standard closure, third: standard powder with plastic closure, fourth: Standard powder with standard closure. Recommend BBP with plastic nozzle closure for all future production and as replacement in rockets now on hand where possible, shipment priority rockets for overseas shipment to cold or temperate climates. This constitutes final Inf Bd report unless otherwise notified, WNO."

2. Authority and Purpose.

a. Authority.

4th Ind, CGSC-AI/13701, 1 Feb 45.

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b. Purpose. Determination of:

(1) Comparative physical characteristics of the subject and standard M7A3 rockets. (Test No. 1)

(2) Comparative accuracy of the subject, standard M7A3 and practice rockets at varying temperatures when fired at vertical targets by an M9E2 Rocket Launcher at 300 and 500 yards range. (Test No. 2)

(3) Comparative ground dispersion of standard M7A3 practice and M6A3 Inert BBP rockets at normal and extreme temperatures. (Test No. 3)

(4) Comparative visibility of flash and smoke of subject and standard rockets. (Test No. 4)

(5) Comparative particle blast of subject and standard rockets. (Test No. 5)

(6) Reliability of functioning of subject and standard igniters under hot, cold and normal conditions. (Test No. 6)

(7) Comparative recoil of the M9E2 rocket launcher when firing subject and standard rockets. (Test No. 7)

(8) Comparative time of flight of subject and standard rockets. (Test No. 8)

3. Description of Material.

The subject BBP (blastless bazooka powder) is a modified EJ type powder alleged to contain 9% filler of EJ powder (7.8% potassium perchlorate and 1.2% carbon black).

Three hundred M6A3, HE, and inert rockets loaded with BBP propellant, were shipped to The Infantry Board for test. All of the subject rockets received were equipped with an aluminum squib with a plastic nozzle closure. This closure prevents moisture or foreign material entering the motor tube. The standard nozzle closure is paper.

One shipment of subject rockets including Lots Nos. 364A and 364B received by The Infantry Board were said to be equipped with heat treated motor tubes and one shipment including Lots 351A and 351B was received with alloy steel tubes.

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The Infantry Board had been advised that rockets with alloy motor tubes were not to be fired at temperatures in excess of 30°F. except by remote control. Rockets with heat treated motors were usable up to 135°F.

4. Factual Background.

The subject project was initiated to develop a better propellant powder for the 2.36" rocket. The burning of the standard propellant, at low temperatures, is erratic and incomplete. Unsatisfactory performance results. Another serious objection to the standard propellant at low temperatures is the back-blast of particles of powder as the rocket leaves the launcher. In the absence of a mask and gloves this back-blast frequently injures the rocketeer.

In previous tests the EJ type of propellant powder was found to eliminate erratic burning and back-blast, but produced an unacceptable residual cloud of visible smoke. Gradual variations in the ratio of the stabilizing components of the powder were tried for the purpose of arriving at a compromise formula which will afford a maximum improvement in burning characteristics with an acceptable minimum of residual smoke, and the subject propellant represents such a compromise formula.

5. Facts Indicated by the Test:

a. The weights of the subject and standard rockets are approximate the same. (Test No. 1)

b. Accuracy and stability of the subject rockets at normal and extreme temperatures exceed standard rockets. (Tests Nos. 2 and 3)

c. The subject rocket produces a light cloud of smoke at the launcher, of greater visibility when uncomplicated by dust effect, than that from the standard rocket; but produces less flash. (Test No. 4)

d. Particle back-blast at normal and extreme temperature of subject rocket is negligible. (Test No. 5)

e. Plastic nozzle closure improves rocket performance. (Test No. 6)

f. Subject rocket produces less recoil than standard rocket when fired through M9E2 launcher. (Test No. 7)

g. The subject rocket has slightly greater time of flight at 72°F. than the standard rocket. (Test No. 8)

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6. Discussion.

Rockets (2.36") loaded with DBP have advantages that definitely outweigh the disadvantage of increased smoke. These main advantages as compared to the standard round are accuracy, ballistic stability, multiple cartridge blast, negligible muzzle flash and less recoil.

7. Conclusions. The Infantry Board concludes:

a. That the DBP propellant in the 2.36" rocket is more desirable than the standard propellant.

b. That the plastic nozzle closure is desirable.

c. That observations subsequent to 13 Oct 44 support data presented in that TAK.

8. Recommendations. The Infantry Board recommends:

a. That DBP propellant rockets with plastic nozzle closure be standardized and incorporated in future 2.36" rockets and in rockets now on hand.

b. That priority overseas shipments be made of DBP propellant rockets with plastic nozzle closures.

EDMUND H. SMITH,
Colonel, Infantry,
President.

1 Incl.
IIB-TAK, 17 Mar 45.

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T E L E T Y P E

~~TELEGRAM~~ ~~RADIOGRAM~~

Distribution (4).
Original and 1 Copy to Signal Center
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HEADQUARTERS
The Infantry School
Fort Benning, Ga.

Date 17 Mar 45

I certify this message is on official business and necessary in the public service:

THORNTON CHASE,
Colonel, A. G. D.,
Adjutant General.

CG
TO: AGF AMC
WASH DC

ATTN REMTS SEC PD REF BBP AND PLASTIC NOZZLE CLOSURE FOR 2.36" ROCKET: TESTS TO DATE INDICATE THAT SUBJECT ROCKETS GIVE: LITTLE OR NO MUZZLE BLAST AND PARTICLE BLAST AT TEMPERATURES OF PLUS ONE HUNDRED TWENTY DOWN TO MINUS THIRTY DEGREES, LESS MUZZLE FLASH, GENERALLY BETTER ACCURACY, ESPECIALLY WHEN COLD, LESS DIFFERENCE IN RANGE AND DISPERSION WHEN FIRED AT DIFFERENT TEMPERATURES, BETTER STABILITY IN FLIGHT AND SLIGHTLY INCREASED RANGE, LESS RECOIL, PLASTIC NOZZLE CLOSURE APPEARS DESIRABLE ON EITHER STANDARD OR BBP ROUNDS. IT GIVE SLIGHTLY BETTER IGNITION, BETTER STABILITY AND ACCURACY, LESS PARTICLE BLAST WITH EITHER BBP OR STANDARD POWDERS AT LOW TEMPERATURES. FOUR PERCENT MISFIRES OBTAINED WITH PLASTIC CLOSURE, DUE TO NOZZLE EDGE SCRAPING INSULATION FROM WIRES AS CLOSURE INSERTED. THIS SHOULD BE CORRECTED. MAIN DISADVANTAGE OF BBP POWDER IS INCREASED SMOKE. THIS MAY BE OBJECTIONABLE UNDER SOME CONDITIONS BUT OF LITTLE IMPORTANCE UNDER OTHERS. FACE MASK APPEARS UNNECESSARY WITH BBP POWDER AND PLASTIC CLOSURE DOWN TO MINUS TWENTY DEGREES. ORDER OF DESIRABILITY

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RECORD of TEST

ON

BBP (Blastless Bazooka Powder) FOR 2.36" ROCKETS

TEST SECTION
THE INFANTRY BOARD

FORT BENNING, GEORGIA

TO: THE DIRECTOR, THE INFANTRY BOARD.
HEREWITH DETAILED RECORD OF TESTS
RELATING TO THE ABOVE PROJECT.

WILLIAM C. RUTHERFORD,
Lt. Colonel, Infantry,
CHIEF, TEST SECTION

8 Copies.

Copy No. 6 Date 20 April 1945

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TEST SECTION
THE INFANTRY BOARD
FT. BENNING, GEORGIA

20 APRIL 1945

SUBJECT: BBP (Blastless Bazooka Powder) FOR 2.36" ROCKETS.

TO : THE PRESIDENT, THE INFANTRY BOARD, FORT BENNING, GEORGIA.

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"C"	Letter, Chief of Ordnance, 471.94/4774(C), with three indorsements, 14 Feb 1945	65

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1. Authority and References.

a. Authority:

(1) Memorandum, The Infantry Board, IB-471.94, 6 February 1945. (Appendix "A")

(2) Letter, Army Ground Forces, 471.94 (C)(1 Dec 1944) GNRQT-11/7102, with five indorsements. (Appendix "B")

b. References:

(1) Letter, Chief of Ordnance, 471.94/4774(C), with three indorsements, 14 Feb. 1945. (Appendix "C")

(2) Report of The Infantry Board No. 1709 - New Propellant (EJA and EJB) for Rocket, 2.36".

2. Introductory Information.

a. This project was initiated for the purpose of producing a better type of propellant powder for the 2.36" rocket.

At low temperatures, the reaction of the standard propellant powder is erratic and incomplete. Poor ballistic performance results. Another objectionable feature, at low temperatures with the standard propellant, is the back-blast of particles of powder frequently causing injury to the rocketeer unless he is protected by a mask and gloves. This feature alone detracts greatly from the usefulness of the weapon by using personnel.

Propellants previously tested by The Infantry Board were not satisfactory. Experimental powder, EJA and EJB, definitely reduced the tendency of particle blast and improved the ballistic performance. However these had the disadvantage of producing a somewhat prolonged residual dense blue-white cloud of smoke at the firing position.

b. Description.

The subject BBP (blastless Bazooka powder) is a modified EJ type powder alleged to contain a 9% filler of EJ powder (7.8% potassium perchlorate and 1.2% carbon black).

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Three hundred M6A3, HE and inert rockets loaded with BBP propellant, were shipped to the Infantry Board for firing tests. Two hundred were inert-loaded and 100 HE loaded.

All of the subject rockets received were equipped with an aluminum squib with a plastic nozzle closure. This closure prevents moisture or foreign material entering the motor tube. The standard nozzle closure is paper.

One shipment of subject rockets including Lots Nos. 364A and 364B received by The Infantry Board were said to be equipped with heat treated motor tubes and one shipment including Lots Nos. 351A and 351B was equipped with alloy steel tubes.

The Infantry Board has been advised that rockets with alloy motor tubes are not to be fired in temperatures in excess of 80°F. except by remote control while rockets with heat treated motors are usable up to 135°F.

Throughout the current tests the standard rockets will be referred to as M6A3 HE or M7A3 practice, while the subject test rockets will be referred to as M6A3, HE or inert, Lot No. 351A, 351B, 364A or 364B.

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3. Purpose of Test.

To determine:

a. The physical characteristic of the BBP rockets as compared with standard rockets.

b. The comparable accuracy on vertical targets of standard and subject BBP rockets at 100, and 300 yards range with rockets at various temperatures.

c. The comparable ground dispersion of standard and M6A3 rockets with BBP propellant at 100, 300 and 600 yards range with rockets at temperatures of -25° F. and 127° F.

d. The visibility of flash and smoke of the subject rockets as compared to standard rockets.

e. The particle blast of the subject rockets as compared with standard rockets.

f. The reliability of functioning of subject and standard rockets under hot, cold and normal conditions.

g. The comparative recoil of the standard and subject rockets.

h. The time of flight of standard and M6A3 rockets with BBP propellant.

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4. Details of Tests and Results are as follows:

Test No. 1

a. Purpose: To determine the comparative physical characteristics of the subject and standard M7A3 Rockets.

b. Method: By measuring and weighing.

c. Results:

	Standard M7A3	M6A3 (inert) with BBP Propellant
Weight of complete rocket	3.38 lbs.	3.40 lbs.
Weight of Tail Assembly	.44 lbs.	.46 lbs.
Weight of Trap Assembly	.04 lbs.	.045 "
Dimensions of Powder Sticks	3/8" x 4-3/16"	3/8" x 4-11/16"
Diameter of aperture in powder sticks	1/16"	3/32"

(See Figures 1 and 2)

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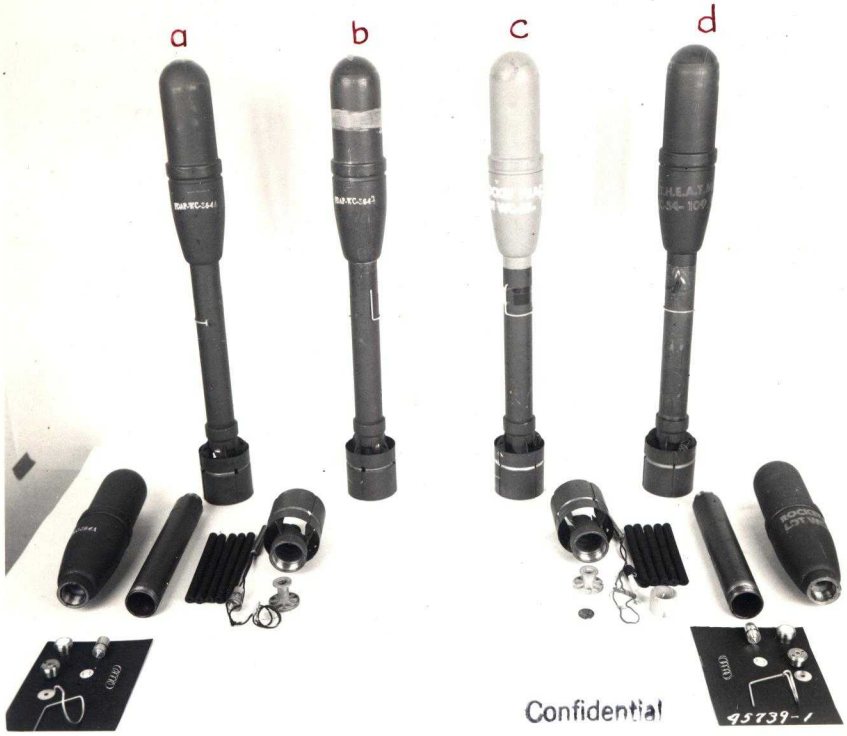

a - M6A3 Rocket, HE, with BBP propellant, Lot No. FDAP-WC-364A, with disassembled rocket in foreground.

b - M6A3 Rocket, Inert, with BBP propellant, Lot No. FDAP-WC-364B.

c - Standard Rocket, M7A3, Practice.

d - Standard Rocket, M6A3, HE, with disassembled rocket in foreground. Note the difference in length of the trap, powder sticks, and length of electric wire in each tail assembly exposed in the photograph.

Figure 1

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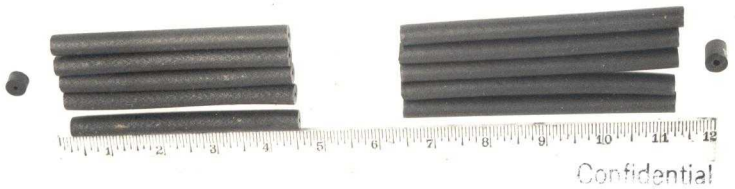

Left - Standard propellant powder sticks. Note that they are shorter than those on the right which are the BBP propellant. Note also the size of the aperture in the powder sticks. BBP sticks have apertures larger than those of the standard sticks.

Figure 2

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Test No. 2

a. Purpose: To determine the comparable accuracy of the subject rockets and standard M7A3, practice, rockets when fired at vertical targets through an M9E2 Rocket Launcher at 100 and 300 yards range with the rockets at various temperatures.

b. Method:

(1) Standard test rockets were subjected to the conditions as follows:

(a) Five Standard M7A3 rockets chilled to -25°F.

(b) Five M6A3, Inert, rockets, Lot No. 351A and 5 HE, Lot No. 351B with BBP Propellant, chilled to -25°F.

(c) Five M6A3, Inert, rockets, Lot No. 364B and 5 HE, Lot No. 364A with BBP Propellant, chilled to -25°F.

(d) Five Standard M7A3 rockets heated to 127°F.

(e) Five M6A3, Inert, rockets, Lot No. 351A, and five HE, Lot No. 351B, heated to 127°F.

(f) Five M6A3, Inert, rockets, Lot No. 364B and five HE, Lot No. 364A, with BBP propellant heated to 127°F.

(g) Five Standard M7A3 rockets at normal 72°F.

(h) Five each M6A3, Inert, rockets, Lot Nos. 351A and 364B, and five each HE, rockets, Lot Nos. 351B and 364A, at normal 72°F.

The above were fired through an M9E2 Rocket Launcher which was securely fastened to a M1917A1 Machine Gun Tripod in order to have the same angle of fire each time. The rockets were fired at a 6' x 6' panel target at 100 yards range.

(2) Five each standard M6A3, HE, and M6A3, Inert, Lot No. 364B, with BBP propellant, were subjected to the same conditions as described in Paragraph b (1), and fired at a 12' x 12' cloth panel target at 300 yards range. The safety pins were not removed in order that the targets would not be damaged by the rockets.

Rockets in Lot Nos. 351A and 351B are alleged to have alloy steel motor tubes and Lot Nos. 364A and 364B are alleged to have heat treated motor tubes.

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c. Results:

(1) 100 yards range at 6' x 6' panel targets - M9E2 Launcher.

Rocket	Temp. (degrees F.)	Dispersion Vertical	Dispersion Lateral
Std. - M7A3 Practice	127	2'4"	2'1"
M6A3, Inert, BB P - Lot No. 351A	127	1'9"	1'4"
M6A3, HE, BBP - Lot No. 351 B	127	2'	1'7"
M6A3, HE, BBP - Lot No. 364A	127	1'6"	1'3"
M6A3, Inert, BBP - Lot No. 364B	127	1'9"	1'7"

	Temp. (degrees F.)	No. Rounds	Vertical	Horizontal
Standard - M7A3 Practice	72	5	1'11"	1'10"
M6A3, Inert, BBP - Lot No. 351A	72	5	1'8"	1'11"
M6A3, HE, BBP - Lot No. 351B	72	5	1'3"	1'3"
M6A3, HE, BBP - Lot No. 364A	72	5	1'8"	1'8"
M6A3, Inert, BBP - Lot No. 364B	72	5	1'3"	1'8"
Standard - M7A3	-25	5	2'10"	2'8"
M6A3, Inert, BBP - Lot No. 351A	-25	5	1'4"	1'3"
M6A3, HE, BBP - Lot No. 351B	-25	5	1'6"	1'5"
M6A3, HE, BBP - Lot No. 364A	-25	5	1'9"	1'7"
M6A3, Inert, BBP, - Lot No. 364B	-25	5	1'11"	1'3"

300 yards range at 12' x 12' panel targets

Standard M6A3 - HE	120	5	12'	12'
M6A3, HE, BBP - Lot No. 364A	120	5	9'	11'6"
Standard M6A3 - HE	72	5	12'	11'2"
M6A3, HE, BBP - Lot No. 364A	72	5	9'3"	9'7"
Standard M6A3, HE	-25	5	13'	14'
M6A3, HE, BBP - Lot No. 364A	-25	5	8'9"	9'

Five rounds were used for sighting in on the target with standard rockets and three rounds used for BBP Rockets.

It was noted that the M6A3 rockets with BBP propellant, were much more stable in flight than were the standard rockets. At 300 yards range, three standard rockets at -25°F. tumbled badly during flight.

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Test No. 3

a. Purpose: To determine the comparable ground dispersion of standard M7A3 Practice and M6A3 Inert BBP rockets at normal and extreme temperatures.

b. Method:

Five each standard and BBP rockets were chilled to -25°F. Five each were heated to 127°F. The above, along with standard and subject rockets at 72°F. were fired through an M9E2 rocket launcher at 100, 300 and 600 yards range. The launcher was mounted on a 1917A1 Machine Gun Tripod while firing. The same angle was maintained for all firing.

c. Results:

The following is a complete record of all rounds fired during the current tests:

Type of Rocket	Range (yards)	No. Rounds	Temp. (degrees F.)	Ground Dispersion Longitudinal	Lateral
Standard M7A3 - Practice	100	5	127	21'4"	3'4"
M6A3, Inert, BBP - Lot No. 351A	100	5	127	14'2"	1'4"

The center of impact of the standard group was 97 yards from the firing point while the center of the BBP group was 107 Yards.

M7A3 - Practice	100	5	72	18'8"	2'11"
M6A3, Inert, BBP - Lot No. 351A	100	5	72	20'6"	3'8"
Standard, M7A3 - Practice	100	5	-25	24'10"	4'1"
M6A3, Inert, BBP - Lot No. 351A	100	5	-25	15'6"	2'2"
Standard, M7A3 - Practice	300	5	127	50'5"	5'
M6A3, Inert, BBP - Lot 351A	300	5	127	24'	12'
Standard, M7A3 - Practice	300	5	72	59'	6'
M6A3, Inert, BBP - Lot No. 351A	300	5	72	41'4"	5'6"
Standard, M7A3, Practice	300	5	-25	60'	4'
M6A3, Inert, BBP - Lot No. 351A	300	5	-25	9'	5'

The center of impact of the standard group was 285 yards from the firing point while the center of the M6A3, Inert, BBP, Lot No. 351A group was 300 yards.

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Type of Rocket	Range (yards)	No. Rounds	Temp. (degrees F.)	Ground Dispersion Longitudinal	Lateral
Standard, M7A3 - Practice	600	5	127	254'	61'
M6A3, Inert, BBP - Lot No. 351A	600	5	127	160'	31'
Standard, M7A3 - Practice	600	5	72	210'	44'
M6A3, Inert, BBP - Lot No. 351A	600	5	72	140'	44'
Standard, M7A3 - Practice	500	5	-25	*554'	66'
M6A3, Inert, BBP - Lot No. 351A	600	5	-25	180'	55'

The center of impact of the standard group was 540 yards from firing point while the BBP group was 590 yards.

* Two rounds tumbed badly and fell short.

It was noted that the M6A3 rockets, with BBP propellant were more stable in flight at 100,300 and 600 yards than were the standard rockets fired at the same ranges.

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Test No. 4

a. Purpose: To determine the comparative visibility of flash and smoke of the subject and standard rockets.

b. Method:

(1) By observation of the back blast of the standard and subject rockets throughout the firing tests.

(2) Observers were posted approximately 350 yards from the rocket launcher position. Both types of rockets were fired as follows:

(a) From a densely wooded area where the rocketeer could not be observed.

(b) Over dusty dry ground.

(c) Over moist grassy ground.

(3) Both types of rockets were fired at night and observers were posted at 50 yards on the flank, 100 yards to rightfront and 600 yards to the front.

c. Results:

(1) Under all conditions, over all types of terrain, when exposed, the position of the firer of M6A3 rockets with BBP propellant could always be discovered, even up to 600 yards due to a cloud of bluish white smoke. The smoke, however, disappeared within a few seconds.

(2) When both types of rockets were fired over dusty dry ground, dust clouds were formed by the back blast with a large bluish colored, longer lived, cloud being produced by M6A3, inert, rockets, with BBP propellant. Figures 3 to 9, incl., show the clouds formed after firing both types of rockets.

Both types of rockets caused similar dust clouds, with the subject rockets having a greater smoke cloud mixed with the dust than did the standard M7A3 rockets.

(3) Over grass covered and moist ground, with green background, the M6A3 inert rockets, with BBP propellant, caused smoke that was visible for approximately 10 seconds after firing. (See Figures 10 and 11)

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(4) A muzzle flash was visible after each standard M7A3 rocket was fired, whereas only occasional sparks and a quantity of smoke was observed pouring from the rocket launcher muzzle after each M6A3, inert, rocket, with BBP propellant was fired.

(5) When both types of rockets were fired at night, a definite muzzle flash could be seen from 50 and 100 yards after each standard M7A3, practice rocket was fired. Only occasional sparks could be seen emerging from the muzzle of the M9E2 rocket launcher after firing M6A3 inert rockets, with BBP propellant. Figures 12 through 17 indicate a decided difference in muzzle flash of the standard and subject rockets.

At 600 yards range it was observed that the standard M7A3 rockets produced a more complete flash than the M6A3 inert rockets, with BBP propellant, when fired through an M9E2 Rocket Launcher. A reddish flash was visible after firing standard M7A3 practice rockets while a light yellowish flash was visible after firing M6A3 inert rockets, with BBP propellant.

Three observers were able to identify each round fired from a distance of 600 yards.

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Test No. 5

a. Purpose: To determine the comparative particle blast of the subject and standard rockets.

b. Method:

Eleven each standard M7A3, practice, and M6A3, inert rockets, with BBP propellant were chilled to -25°F. and heated to 125°F. for 24 hours. Also eleven each rockets were allowed to remain at 72°F. for the same period of time. A blast screen of target cloth and paper (Figure 18) was constructed to show the extent and nature of the back blast from each type of rocket. The rockets were fired from an M9E2 Rocket Launcher securely fastened to an M1917A1 Machine Gun Tripod. All rockets were fired at the same elevation.

c. Results:

(1) There was no noticeable particle blast from M6A3, inert rockets with BBP propellant at 125°F and 72°F. Several very light ash like particles were noticed on the blast screen from the above rockets fired at -25°F. (Figures 19, 20, 21 and 22)

(2) Standard M7A3, practice rockets at 125°F. produced little particle blast as shown in Figures 23 and 24. Standard M7A3, practice rockets at 72°F. produced some particle blast as evidenced by Figure 25. These particles possibly would have injured the firer.

(3) Standard M7A3, practice rockets chilled to -25°F. produced sever particle blast on the paper screen, most of which would have cut or burned an unprotected rocketeer.

(4) The Test Officer fired several rounds of chilled M6A3, inert rockets with BBP propellant through an M9E2 Rocket Launcher unprotected without injury. The rockets were chilled to -25°F.

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Test No. 6

a. Purpose: To determine the reliability of functioning of the subject and standard igniters under hot, cold and normal conditions.

b. Method:

(1) Approximately 150 subject igniters were observed under various conditions of the current test firing and results recorded.

(2) Fifteen standard M7A3 and BBP rockets were chilled to -25°F. Ten of each were interchanged. All were fired through an M9A2 Rocket Launcher, fixed on an M1917A1 Machine Gun Tripod at 162 mils elevation. Ground dispersion, particle blast, stability of flight, as well as functioning were recorded for each 5 round group.

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c. Results.

Type of Rocket	Type of Igniter	No. Rounds	Temperature of Rockets (degrees F.)	Elevation of Launcher (mils)	Ground Dispersion Vertical (feet)	Ground Dispersion Horizontal (feet)	Remarks
M6A3, inert, BBP, Lot No. 351A.	Standard Igniter	5	-22	162	88	9	Particle Blast - two hangfires - one round tumbled.
M7A3, Practice.	Subject igniter w/ plastic closure.	5	-22	162	100	5	One round tumbled - flight characteristics poor.
M6A3, inert, BBP, Lot No. 351A.	Subject igniter w/ plastic closure.	5	-22	162	24	9	
Std. M6A3, HE.	Standard igniter.	5	-22	162	235	12	Two rounds tumbled - two hangfires - some chuffing.
M6A3, inert, BBP, Lot No. 351A.	Standard igniter.	5	-22	162	157	6	Some chuffing - two hangfires.
Std. M6A3, HE.	Subject igniter w/ plastic closure	5	-22	162	92	5	One round tumbled.

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d. Indications

(1) Standard rockets with plastic closures in the tail assemblies, gave better flight stability, decreased hangfires, and reduced particle blast at low temperatures as compared to standard rockets with standard igniters. (See Figure 26)

(2) M6A3 rockets with BBP propellant, with standard igniter, produced less accuracy than the same rockets fired using the subject plastic closures on the igniters. In addition some particle blast is produced. (See Figure 27)

(3) Six misfires occurred during the firing of 150 rockets M6A3 with BBP propellant, Lots Nos. 351A, 351B, 364A and 364B. An inspection revealed that the positive lead wire was grounded out against the rocket tail, at the junction of the rear end of the plastic closure and the tail assembly of the rocket. Evidently when the plastic closure was inserted in the tail assembly, the fabric cover on the positive lead wire was broken. (See Figure 28.)

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Test No. 7

a. Purpose: To determine the comparative recoil of the M9E2 Rocket Launcher when firing standard and subject rockets:

b. Method: An M9E2 Rocket Launcher was suspended as a pendulum. A pencil was secured to the rocket launcher to record the height in inches that the launcher was lifted by the force of the recoil when firing both standard and subject rockets. The movement was recorded on a plywood panel placed parallel to the launcher and 4" to the right side.

The foot-pounds of energy produced by the recoil of the launcher with both standard and subject rockets fired through a M9E2 rocket launcher was computed.

c. Results: The following is a record of all rounds fired and the computed foot-pounds of energy produced by the recoil of the M9E2 Rocket Launcher when firing standard and subject rockets at normal and extreme temperatures.

Two men fired five each standard and subject rockets at -25°F. from a standing position.

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Std., M7A3, Practice, 72° F.

Lift in inches	Foot Pounds
2.6	2.25
2.8	2.46
3.6	3.2
4.0	3.54
3.3	2.89

M6A3, Inert, BBP, Normal, 72°F.
Lot No. WC 364B

Lift (inches)	Foot Pounds
.61	.53
.68	.64
.76	.75
.80	.75
.90	.85

Std., M6A3, HE, Normal, 72°F., Lot No. 54-109

2.9	2.57
5.4	4.82
10.2	9.12
10.3	9.20
8.1	7.18

M6A3, HE, BBP, Normal, 72°F., Lot WC-351-B

1.1	.96
1.2	1.07
1.6	1.39
1.6	1.39
1.9	1.71

Std., M6A3, HE, -25°F., Lot No. WC-54-109

7.2	6.43
7.6	6.65
7.9	6.86
8.3	7.4
8.5	7.51

M6A3, HE, BBP, -25°F., Lot No. 351B

1.5	1.28
1.7	1.50
2.1	1.82
2.2	1.93
2.5	2.14

Std., M7A3, Practice, -25°F., Lot WC-87-51

8.9	7.94
9.7	8.58
10.7	9.54
11.1	9.87
12.6	10.73

Std., M7A3, Practice, hot, 127°F., WC-87-51

2.9	2.57
3.2	2.78
3.4	3.0
5.3	4.22

Std., M6A3, HE, Hot, 127°F., Lot WC-54-109

2.5	2.14
2.9	2.57
3.1	2.68
3.4	3.0
3.6	3.2

M6A3, Inert, BBP, Hot, 127°F., WC-364-B

.53	.42
.6	.53
.7	.62
.83	.75
1.2	1.07

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M6A3, Inert, BBP, 127°F., Lot #351-A.

Lift in inches	Foot Pounds
.55	.42
.63	.53
1.0	.85
1.1	.96
1.2	1.07

M6A3, Inert, BB P, Hot, 127°F, MC-364-B.

Lift in inches	Foot Pounds
1.1	.96
1.3	1.07
1.4	1.18
1.5	1.28
1.5	1.23

M6A3, Inert, BBP, Hot, 127°F., MC-351-A.

.60	.53
.84	.75
.95	.84
1.1	.96

M6A3, HE, BBP, -25°F. below 0° MC-351-B.

1.8	1.6
2.0	1.71
2.0	1.71
2.3	2.03
2.4	2.14

M6A3, HE, BBP, Hot, 127°F., Lot #351-B.

.80	.75
.90	.85
1.2	1.07
1.4	1.18

d. Indications:

M6A3 Rockets with BBP Propellant at all temperatures in the current test produced less foot-pounds of energy due to the recoil of the launcher.

The Test Officer and assistant noted the following when firing both standard and subject rockets at -25°F. from a standing position.

A face mask was necessary while firing standard rockets. No mask was necessary when firing M6A3 Rockets at -25°F. with BBP propellant through an M9E2 Rocket Launcher.

The T90 Sight was moved forward from 5° to 30° and upward from 100 to 350 yards on the range indicator due to the recoil of the launcher "Pushing" the sight back against the eye of the firer, when firing standard rockets at -25°F.

The T90 Sight did not move out of position after firing any M6A3, Inert, Rockets, with BBP propellant, through an M9E2 Rocket Launcher.

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Test No. 8

a. Purpose: To determine the comparable time of flight of standard and subject rockets.

b. Method: Ten each standard M7A3, practice rockets, and M6A3 inert rockets, Lot No. 364B with EBP propellant, were timed during flight with a standard stop watch. The rockets were fired through an M9E2 Rocket Launcher at an elevation of 162 mils. The rockets were at 72°F.

c. Results: The average time of flight for the ten standard M7A3 rockets was 2.8 seconds as compared to 3 seconds for the average time of ten M6A3, Inert, Lot No. 364B, rockets with EBP propellant.

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5. Summary of Facts Disclosed by Tests.

a. The subject and standard rockets weigh 3.40 lbs. and 3.38 lbs. respectively. The propellant powder sticks measure 3/8" x 4-3/16" for standard rockets and 3/8" x 4-11/16" for subject M6A3 rockets with BBP propellant. (Test No. 1)

b. M6A3 rockets with BBP propellant fired through an M9E2 Rocket Launcher are more accurate on vertical targets at normal and extreme temperatures. Flight stability of the subject rockets was better than the standard rockets. (Test No. 2)

c. Ground dispersion of M6A3 rockets with BBP propellant, at 100, 300 and 600 yards range is materially less than standard rockets. The M6A3 rockets with BBP propellant were more stable in flight than were standard rockets. (Test No. 3)

d. M6A3 rockets with BBP propellant may be identified by a long-lived bluish-white smoke cloud, when observed from 350 yards over open terrain. Little or no muzzle flash is noted with M6A3 rockets with BBP propellant. (Test No. 4)

e. The particle blast of the subject rockets is negligible at normal and extreme temperatures. (Test No. 5)

f. Six of 150 subject rockets fired resulted in misfires due to a grounded positive lead wire in the ignition assembly. Plastic closures on the igniters improved the ballistic characteristics of standard rockets. (Test No. 6)

g. The recoil caused by the subject rockets fired through an M9E2 Rocket Launcher is materially less than standard rockets. (Test No. 7)

h. The average time of flight of standard M7A3 inert rockets is less than for subject rockets.

WILLIAM F. SCHNEIDER
Capt., Infantry,
Test Officer.

I concur in the above Record of Test:

WILLIAM C. RUTHERFORD,
Lt. Colonel, Infantry,
Chief of Test Section.

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